

# Applications of Synchrotron Infrared Microspectroscopy to Ink-Paper Material Interactions

T.J. Wilkinson, D. L. Perry, M. C. Martin, and W. R. McKinney  
Lawrence Berkeley National Laboratory, University of California, Berkeley, CA 94720

A.A. Cantu  
U. S. Secret Service, U. S. Department of the Treasury, Washington, DC 20373

Synchrotron infrared microspectroscopy has been used to study the chemistry of ink-paper material interactions in the mid-infrared region ( $4000\text{--}400\text{ cm}^{-1}$ ) as a function of both ink and paper type and artificial aging of the ink-paper sets as occurs in handwriting. Band intensities and band intensity ratios for functional groups of chemical molecules that are inherent to the experimental system are discussed in the context of molecular components as they are perturbed by interactions between the ink and paper surfaces. Mapping using spectral markers for the ink-paper interactions at the ink-paper interfaces is presented and discussed. Changes in the chemistry of the ink will be discussed in context of the aging process which is reflected in the changes of the infrared spectra.

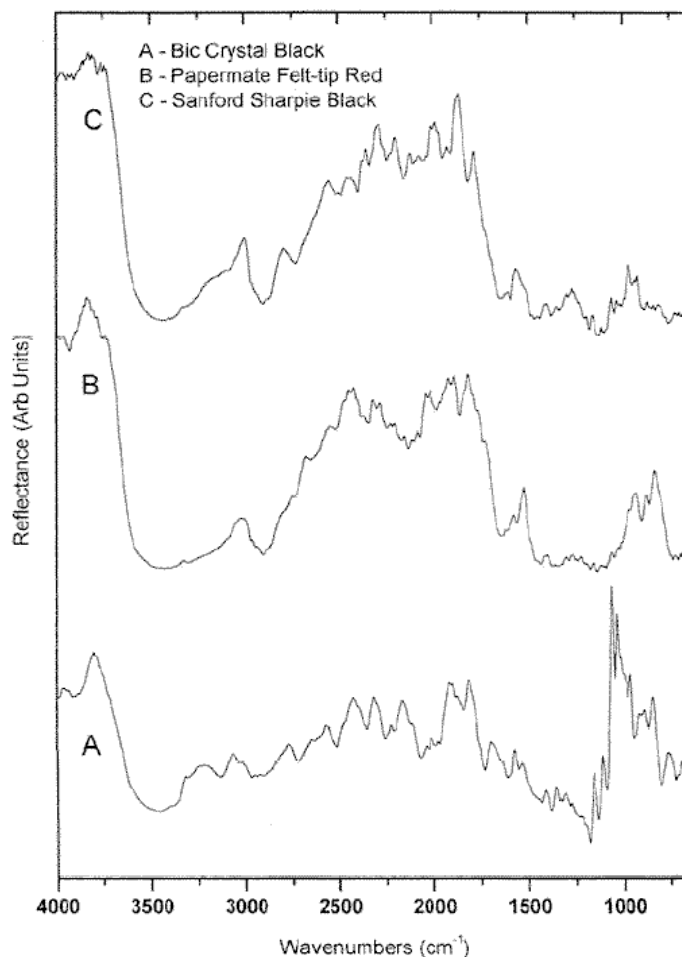


Figure 1. Infrared spectra of a commercial black ink (a), a commercial red ink (b), and a different commercial black ink (c) all on Whattman 3MM Chr Chromatography paper.

This work was supported by the Special Technologies Program, the Center for Science and Engineering Education (CSEE) at Lawrence Berkeley National Laboratory, and the Director, Office of Basic Energy Sciences, Materials Science Division, of the U. S. Department of Energy under Contract No. DE-ACO3-76SF00098.

Principal investigator: Dale L. Perry, Lawrence Berkeley National Laboratory. Email: [DLPerry@lbl.gov](mailto:DLPerry@lbl.gov). Telephone: 510-486-4819.